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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,798	06/20/2003	Hagai Attias	MS302099.1 / MSFTP435US	9699

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EXAMINER	
SIEDLER, DOROTHY S	
ART UNIT	**PAPER NUMBER**
2626	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/22/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/600,798	ATTIAS ET AL.	
	Examiner	Art Unit	
	Dorothy Sarah Siedler	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 June 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12-8-03,10-25-05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This is the initial response to the application filled on June 20, 2003. Claims 1-21 are pending and are considered below.

Specification

The disclosure is objected to because of the following informalities: Numerous grammatical and spelling errors exist. For example "the system 100 utilizes a variational approach is taken" on page 5 lines 13-14, and "build-in" on page 6 line 9. Also, "Kullback-Liebler" in misspelled, and should read "Kullback-Leibler". Examiner has provided examples, and not a complete listing of grammatical and spelling errors. Therefore applicant is encouraged review the remaining specification and correct any and all errors.

Appropriate correction is required.

Information Disclosure Statement

The information disclosure statement filed December 8, 2003 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. The non-patent literature cited on the statement does not have the corresponding document

scanned into to IFW, therefore, unless noted in the PTO-892, those documents have not been considered.

Claim Objections

Claims 4,9,10,16 and 18 are objected to because of the following informalities: Claims 4 and 16 use the variable N which is not defined, claim 9 uses the variables A, I, and u, which are not defined; claim 10 uses B, and u which are not defined; and claim 18 uses N which is not defined.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 10 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 10 uses the variable B_s, however this variable is not defined in either the claims or the specification. The examiner interprets

this value as corresponding to duration parameter(s). This interpretation is used throughout the remainder of the office action.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1- 20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 1 recites a system which does fall within one of the statutory categories. However, claim 1 recites "an input component" and "a model component" which are software components within a larger computer program, as evident by the specification as well as claim 20. Therefore claim one is claiming an abstract idea, or functional descriptive material, and since no practical application is provided, the claim is directed towards non-statutory subject matter.

Claims 12,14 and 17 are rejected for similar reasons, i.e. they claim functional descriptive material, as evident by the specification and claim 20.

Claim 19 recites "a data packet transmitted between two or more computer components", however a data packet does not fall into one of the statutory categories. A data packet is merely information, or an abstract idea, and thus non-statutory.

Claim 20 recites "a computer readable medium storing computer executable components of a system" which does not meet the requirements set forth in The Interim Guidelines. A computer component, as defined by the specification, can be software, hardware, or a combination of the two. However, a computer readable medium storing hardware is not physically possible, nor does it meet the requirements as set for by the Interim Guidelines, which dictate the procedure for appropriately claiming software, and only software, on a computer readable medium. Thus, for the previous reasons claim 20 is non-statutory.

Independent claims 1, 12,14,17, 19 and 20 are all non-statutory, thus rendering all dependent claims non-statutory.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3,5,11-13,19-21 are rejected under 35 U.S.C. 102(b) as being anticipated by ***Hogden*** (6,052,662).

As per claims 1,20 and 21, ***Hogden*** discloses a system and computer readable medium (claim 1) that facilitates modeling unobserved speech dynamics comprising:

- an input component that receives acoustic data (column 10 line 49);

- a model component that models speech based, at least in part, upon the acoustic data, the model component comprising model parameters which characterize aspects of the unobserved dynamics (*pseudo-articulator positions*) in speech articulation, and, which characterize a mapping relationship from the unobserved dynamic variables (*pseudo-articulator positions*) to observed speech acoustics, the model parameters modified based, at least in part, upon a variational learning technique (train*ing, i.e. adjustment of PDF parameters)*, and a technique for decoding an underlying unobserved phone sequence of speech based, at least in part, upon a variational learning technique (column 5 lines 10-25 and column 8 lines 5-9).

As per claim 12, ***Hogden*** discloses a method that facilitates modeling speech dynamics comprising:

- recovering speech from acoustic data based, at least in part, upon a speech model having at least two sets of parameters, a first set of parameters describing unobserved speech dynamics (*pseudo-articulator positions*) and a second set of parameters describing a relationship between the unobserved speech dynamic vector and an observed acoustic feature vector (column 5 lines 10-33, *the continuity map provides a mapping between a variable and a map position, i.e. a sound type and it's articulation*);

- calculating a posterior distribution based on the above model parameters (column 5 lines 10-33, *PDF*); and,
- modifying at least one of the model parameters based, at least in part, upon the calculated posterior distribution (column 8 lines 5-9, *adjust parameters of the PDF*).

As per claim 19, ***Hogden*** discloses a data packet transmitted between two or more computer components that facilitates modeling of speech dynamics, the data packet comprising: data associated with recovered speech, the recovered speech being based, at least in part, a speech model based upon acoustic data and model parameters, and the model parameters including at least one articulation parameter and at least one duration parameter (column 20 lines 54-63 and column 6 lines 53-61, *speech is encoded as a pseudo-articulator path, or position, the path including articulator position during a particular time (articulation and duration)).*

As per claim 2, ***Hogden*** discloses the system of claim 1, as well as modification of at least one of the model parameters being based upon a variational Expectation Maximization algorithm having an E-step and M-step (column 8 line 45 –51, *a path that maximizes the conditional probability data is determined*).

As per claim 3, ***Hogden*** discloses the system of claim 2, as well as modification of at least one of the model parameters being based, at least in part, upon a mixture of Gaussian (MOG) posteriors based on a variational technique (column 9 lines 14-17).

As per claim 5, ***Hogden*** discloses the system of claim 2, as well as modification of at least one of the model parameters being based, at least in part, upon a mixture of hidden Markov model (HMM) posteriors based on a variational technique (column 6 lines 24-46).

As per claim 11, ***Hogden*** inherently discloses a speech recognition system employing the system of claim 1 (column 1 lines 24-26).

As per claims 13, ***Hogden*** inherently discloses the method of claim 12 further comprising receiving the acoustic data (column 10 line 49).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6,17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over ***Hogden*** in view of ***McDonough*** (5,652,748).

As per claim 6, ***Hogden*** discloses the system of claim 1, the model component selecting an approximate posterior distribution relating to the acoustic data (column 5 lines 10-33), but does not disclose optimizing a posterior distribution by minimizing a Kullback-Leibler (KB) distance thereof to an exact posterior distribution. ***McDonough*** discloses the use of the Kullback-Leibler distance to determine a likely sequence of words or phrases in a speech recognition system (column 11 lines 40-63). In addition, ***McDonough*** discloses that the Kullback-Leibler distance is known in the art, and one of many types of probability models used, any of which would produce an accurate and useful result.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify at least one of the model parameters based, at least in part, upon the calculated approximated posterior distribution and minimization of a Kullback-Leibler distance of the approximation from an exact posterior distribution in ***Hogden***, since the Kullback-Leibler distance is one of many probability models commonly used, therefore enabling the use a readily available software products or algorithms designed for its use.

As per claim 17, ***Hogden*** discloses a method that facilitates modeling speech dynamics comprising:

- recovering speech from acoustic data based, at least in part, upon a speech model (column 6 lines 24-46);
- calculating an approximation of a posterior distribution based on model parameters, the model parameters and the approximation based upon a hidden Markov model posteriors (column 6 lines 24-46);

However, ***Hogden*** does not disclose modifying at least one of the model parameters based, at least in part, upon the calculated approximated posterior distribution and minimization of a Kullback-Leibler distance of the approximation from an exact posterior distribution. ***McDonough*** discloses the use of the Kullback-Leibler distance is used to determine a likely sequence of words or phrases in a speech recognition system (column 11 lines 40-63). In addition, ***McDonough*** discloses that the Kullback-Leibler distance is known in the art, and one of many types of probability models used, any of which would produce an accurate and useful result.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modifying at least one of the model parameters based, at least in part, upon the calculated approximated posterior distribution and minimization of a Kullback-Leibler distance of the approximation from an exact posterior distribution in ***Hogden***, since the Kullback-Leibler distance is one of many probability models

commonly used, therefore enabling the use of readily available software products or algorithms designed for its use.

As per claim 18, ***Hogden*** in view of ***McDonough*** disclose the method of claim 17, and ***Hogden*** further discloses calculation of the approximation of the posterior distribution being based, at least in part, upon: the recited equation, where x is a state of the model, s is a phone index, n is a frame number, and, q is a posterior probability approximation. (column 9 lines 27-28, Equation 2, *which for conditional independence among frames, becomes the same function as the equation in the instant application*).

Claims 4 and 7-10 is rejected under 35 U.S.C. 103(a) as being unpatentable over ***Hogden*** in view of ***Ghahramani*** ("Variational Learning for Switching State-Space Models" Ghahramani et al., Neural Computation 2000).

As per claim 4, ***Hogden*** discloses the system of claim 3, but does not disclose the model component being based, at least in part, upon: the recited equation. ***Ghahramani*** discloses the use of a probability approximation equation comprising a product or probabilities (page 7, Section 3: The Generative Model, equation 2). The equation of the instant application is the standard joint probability equation, modified for independent frames to produce a product of probabilities.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the equation, as noted previously, in ***Hogden***, since it is

an established formula used within the statistics discipline, therefore enabling the use of readily available software products or algorithms designed for its use.

As per claim 7 and 8, ***Hogden*** discloses the system of claim 1, as well as the model component being based, at least in part, upon a hidden dynamic model (Abstract, *probabilistic mapping between speech sounds and articulator positions*) but does not disclose the model being in the form of segmental switching state space model. ***Ghahramani*** discloses a probabilistic time-series model in the form of a segmental switching state space model (page 7 section 3: The Generative Model). In addition, ***Ghahramani*** discloses that the switching state space model can be used in a wide range of disciplines, including signal processing. The speech recognition discipline is a subset of signal processing therefore ***Ghahramani*** suggests that these models can be implemented as speech recognition models.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a model in the form of a segmental state space model in ***Hogden***, since it can accurately represent dynamic phenomena, characterized by a combination of discrete and continuous dynamics, as indicated in ***Ghahramani*** (introduction), such as speech.

As per claim 9 and 10, ***Hogden*** in view of ***Ghahramani*** disclose the system of claim 7, and ***Ghahramani*** further disclose the model component employing, at least in part, the

state equation: the recited equation, and probability distributions the recited equation (page 2, Section 2.1 State-space model, equations (5) and (3) and equation (1)).

Therefore it would have been obvious to one of ordinary skill in the art to use the equation, as noted previously, in ***Hogden***, since it would accurately model the input and output behavior of a system, i.e. the conditional probability of an output given a specific input, as indicated in ***Ghahramani*** (page 2 section 2.1 State-space models).

Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over ***Hogden*** in view of ***Ghahramani***, and further in view of ***McDonough***.

As per claim 14, ***Hogden*** disclose a method that facilitates modeling speech dynamics comprising: calculating an approximation of a posterior distribution based on model parameters, the model parameters and the approximation based upon a mixture of Gaussians (column 9 lines 14-17). However, ***Hogden*** does not disclose recovering speech from acoustic data based, at least in part, upon a speech model in the form of segmental switching state space model and, modifying at least one of the model parameters based, at least in part, upon the calculated approximated posterior distribution and minimization of a Kullback-Leibler distance of the approximation from an exact posterior distribution.

Ghahramani discloses recovering speech from acoustic data based, at least in part, upon a speech model in the form of segmental switching state space model (page

7 section 3: The Generative Model). ***Ghahramani*** also discloses that the switching state space model can be used in a wide range of disciplines, including signal processing. The speech recognition discipline is a subset of signal processing therefore ***Ghahramani*** suggests that these models can be implemented as speech recognition models. In addition, ***McDonough*** discloses modifying at least one of the model parameters based, at least in part, upon the calculated approximated posterior distribution and minimization of a Kullback-Leibler distance of the approximation from an exact posterior distribution (column 11 lines 40-47). ***Hogden, Ghahramani*** and ***McDonough*** all disclose systems that model observations in relation to states, or hidden states, for the purpose of speech recognition.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to recover speech from acoustic data based, at least in part, upon a speech model in the form of segmental switching state space model and, modifying at least one of the model parameters based, at least in part, upon the calculated approximated posterior distribution and minimization of a Kullback-Leibler distance of the approximation from an exact posterior distribution in ***Hogden,*** since a segmental switching state-space model can accurately represent dynamic phenomena, characterized by a combination of discrete and continuous dynamics, as indicated in ***Ghahramani*** (introduction), such as speech, and the Kullback-Leibler distance is one of many probability models commonly used, therefore enabling the use of readily available software products or algorithms designed for its use.

As per claim 15, ***Hogden*** in view of ***Ghahramani*** further in view of ***McDonough*** disclose the method of claim 14, and ***Hogden*** further discloses receiving the acoustic data (column 10 line 49).

As per claim 16, ***Hogden*** in view of ***Ghahramani*** further in view of ***McDonough*** disclose the method of claim 14, and ***Ghahramani*** further discloses calculation of the approximation of the posterior distribution being based, at least in part, upon: (see equation claim 16) (page 7, Section 3: The Generative Model). ***Ghahramani*** discloses the use of a probability approximation equation comprising a product or probabilities (page 7, Section 3: The Generative Model). In addition, the equation of the instant application is the standard joint probability equation, modified for independent frames to produce a product of probabilities. The joint probability equation has been used in the discipline of statistics for many years, and is an established and well known equation.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the equation, as noted previously, in ***Hogden***, since it is an established formula used within the statistics discipline which is an effective way to determine the chances of two events occurring at the same time.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Papcum (5,440,661) discloses a system which uses inferred articulatory movements as part of speech recognition.
- Picone ("Initial Evaluation of Hidden Dynamic Models on Conversational Speech" Picone et al, IEEE 1999) discloses the use of Hidden Dynamic Models for the inference of targets in a hidden feature space.
- Richards ("Vocal Tract Shape Trajectory Estimation Using MLP Analysis-by-synthesis" IEEE 1997) discloses a system that uses acoustic speech signals to infer vocal tract shape trajectories.
- Ma ("A Mixture Linear Model with Target-Directed Dynamics for Spontaneous Speech Recognition" IEEE 2002) disclose a MLDM model which is used to represent VTR behavior, and map the VTR to acoustic representations.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dorothy Sarah Siedler whose telephone number is 571-270-1067. The examiner can normally be reached on Mon-Thur 9:30am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on 571-272-7602. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

D.S.S.
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PRIMARY EXAMINER